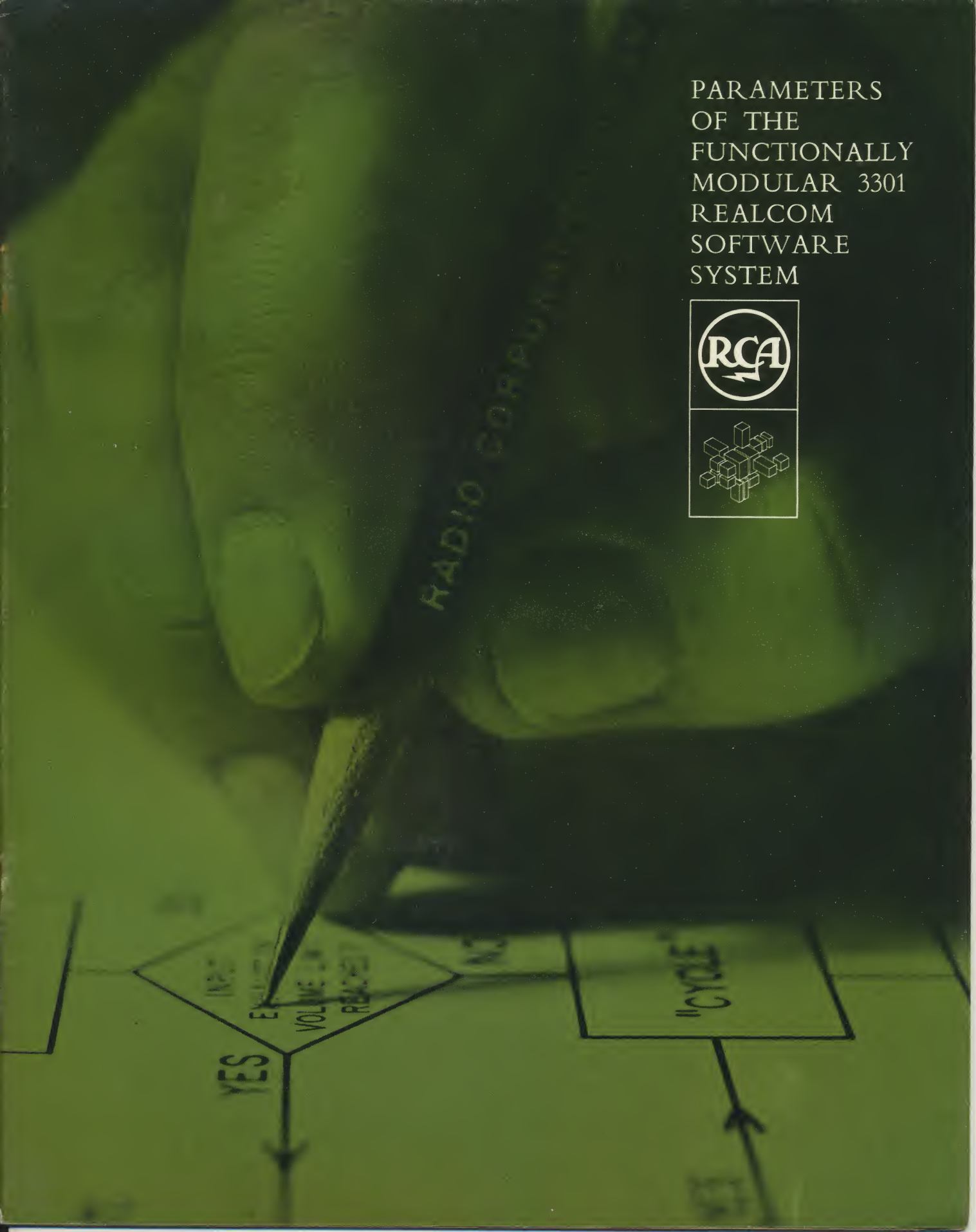
PARAMETERS OF THE FUNCTIONALLY MODULAR 3301 REALCOM SOFTWARE SYSTEM



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As related by E. H. Perlman

"...the 3301 Realcom software system...will inevitably reduce programming and training costs, and increase operating efficiency."

"...3301 Realcom software system is both complete and flexible ...supports the user's total needs right from source program preparation through final operating stages."

"...the 3301 Operating System has been designed to control execution of all 3301 programs ...contains all routines required to control the entire physical environment of the computer."

E. H. Perlman has held a number of management positions with RCA Electronic Data Processing during the past 12 years. Prior to assuming his present post as Manager of the Eastern Region, he headed the Marketing Systems Services and Programming Department, responsible for the development and implementation of RCA computer software.

Those of you who have had opportunity to evaluate the new RCA 3301 Realcom know that it is a powerful and unusually versatile machine. And, if you are typical of others who have been exposed to this computer, you may be wondering if the associated software is fully developed. The answer is "Yes." Further, the 3301 Realcom software system is as versatile as the hardware itself—a characteristic which will inevitably reduce programming and training costs. But before we get into a discussion of specifics, let me comment briefly on the planning which accompanied development of this software system. Concurrent Hardware & Software Development It was apparent at the outset that this was to be a most versatile software system because 3301 Realcom design requirements called for a computer which would process data in any or all of four major application areas: business, scientific, real-time and communications. Fortunately, both hardware and software systems were developed concurrently. This gave us the lead-time required to design, implement and check out a complete software system prior to delivery of the first 3301. Simply stated, our objective during this period was development of a software system which would enable the user to prepare, test and operate his applications at minimum cost. It should be mentioned, incidentally, that this parallel development paved the way for many hardware and software features which otherwise would not have been possible. Unique Operating System For example, a complete software package called the 3301 Operating System has been designed to control execution of all 3301 programs . . . and I should like to stress the word "all." The Operating System is an entity in itself. It contains all routines required to control

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the entire physical environment of the computer. All source language translators generate linkage to this single Operating System so that the execution of all computer programs is controlled in the same manner. This means that operating procedures in a 3301 installation are consistent for all applications, regardless of the source language employed. Functionally Modular Software This brings us to a particularly interesting aspect of 3301 Realcom capabilities. In view of the unusually wide range of devices available on this machine, it is essential that the software system accommodate all possible combinations of hardware. Consequently, the Operating System must contain all routines needed for the most complex application. With this in mind, it is natural to ask: "How much memory overhead am I penalized for device-controlling routines which I don't need?" The answer is, "None." The system is so constructed that only the modules required at a given point in time are actually employed during program execution. This means that a complete system can be made available to the user to satisfy even the most complex need (real-time and serial processing operating concurrently across a multi-computer network, for example) without penalizing the user who may not have (or have need for) maximum computer capabilities. Further, the modular nature of the Operating System, along with separation of user programs from the system, permits the automatic substitution of routines as application needs increase. A Growth System As an example, consider the simultaneous capabilities of the 3301 Realcom. The basic computer is shipped with two simultaneous I/O modes. Should a user require additional simultaneous ability, he may add a third I/O mode to the hardware. This will

"A complete library maintenance system is also provided."

"COBOL, FORTRAN and a symbolic language assembler are available to 3301 users."

be automatically utilized by the Operating System without reprogramming, recompilation or reassembly of the programs using that computer. This software modularity is, we feel, a major benefit of the 3301 Realcom system. The ability of a user to take advantage of new hardware without a major reprogramming job is unique. Users can add real-time facilities to existing installations and still continue to run existing programs simultaneously with new applications. More significant, however, is the ability to process data in a serial manner and then move up to random processing with a minimum of change. Since the Operating System controls all physical accessing of data external to the computer, it is possible to replace the serial access routine with a random access routine within the Operating System itself—and do it without changing the user's processing logic. In addition, 3301 software system permits the user to define his logical processing in terms of independent modules which are linked by a task description. Should he desire to change his program solution, he can do so by merely redefining the modules which comprise his task and the manner in which these modules tie together. This feature affords the user a degree of flexibility with his programs that matches flexibility inherent in the hardware. New Sort/Merge Technique The sort/merge system utilizes a technique called the "Oscillating Sort." Our experience with it shows that it yields a substantial time saving over the traditional methods of sorting and merging. The significant difference in this technique is that the internal sort phase (string generation) is not carried to completion before the merging phases are initiated. Rather, a portion of the input is processed through string generation, and then the strings are merged. The next

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"The sort/merge system...called the 'Oscillating Sort' ...yields a substantial time saving..."

portion of the input is then processed through string generation, etc. This oscillation between the generation and merging phases prompted use of the term, "Oscillating Sort." Service Programs Service programs supplied with the 3301 will include the standard peripheral conversion routines familiar to most computer users (card-to-tape, etc.). A complete library maintenance system is also provided.

Also, 3301 Realcom is compatible with the RCA 301. This feature provides a most convenient and economical means of growth for hundreds of present 301 users, and in addition, puts a wide range of existing software at the immediate disposal of 3301 users. Program Testing Provisions Where program testing is concerned, we provide two debugging techniques for use on the 3301. Recognizing the inefficiency which results from debugging at the console, we have developed a completely automatic testing system which permits preplanning of a test session. Operator intervention is seldom required. Essentially, the programmer indicates trap points in his program at which diagnostic aids are to be employed. In addition, a "hang" procedure can be specified so that unscheduled program halts can be accommodated with minimum operator direction. There is always the case, however, where the programmer prefers to exercise direct control over a debugging session. In this case, an "on-line" testing procedure can be employed which allows the programmer to stop at various places during execution of the test and initiate snapshot or display procedures directly at the console. A Complete System The 3301 Realcom software system supports all areas of user effort. In the area of preparation, for example, we provide programming languages (and translators) in order to simplify application

RCA 3301 REALCOM SOFTWARE—A COMPLETE PACKAGE

1. RCA 3301 Realcom Operating System
   a. Executive Control System (ECS)
   b. File Control Processor (FCP)
   c. Operator Routines & Debugging Aids
      Initiate Task
      Display
      Alter
      Continue Task
      Terminate Task
      Memory Dump
      Tape Print
      Instruction Address Stop
2. RCA 3301 Realcom Assembly System
3. Cobol—61 Extended
4. Fortran II & IV
5. Report Program Generator
6. 3301 Service Programs
   a. PLT Maintenance System
   b. Utility Routines
      Tape Copy
      Tape Compare
      Test Data Distribution
   c. Peripheral Conversion Routines
      Card to Tape (mag. tape)
      Tape (paper tape) to Tape (mag. tape)
      Tape (mag. tape) to Cards
      Tape (mag. tape) to Tape (paper tape)
      Tape (mag. tape) to Printer
   d. Management Aids
   e. Scientific Routines

RCA 3301 Sort/Merge System

RCA 301/3301 Compatibility Program

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